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(54) AV DATA RECORDER AND ITS METHOD, DISK RECORED BY AV DATA RECORDER AND THE METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an audio-visual data recorder and a method, which can minimize a seek time even if a UDF file system is used.

SOLUTION: The audio-visual data recording method provides file management information and manages files that consists of grouped extents of continuous blocks on a disk. The data recording method generates a new directory and new file and concurrently reserves a reserved area in the file management information in order to record the new directory and file

management data for the new files. In addition to the new directory and the file management data, in the reserved area the method also records a usage status of the file management information.

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CLAIMS

[Claim(s)]

[Claim 1] The disk as a record medium of AV data, and the record-medium mechanical component which drives said disk, The record playback section which records data on said disk or reproduces the recorded data, The memory section which memorizes data temporarily, and AV signal-processing section which carries out the interconversion of AV signal and the digital

signal, It is AV data recorder equipped with the system control section which controls the record approach. It has the file management information which manages as an extent the block with which it continued on said disk, carries out grouping of said extent and is managed as a file. The reservation field for recording the management information about said directory and file on said file management information at the same time it newly creates a directory and a file on said disk is secured. AV data recorder characterized by recording the information about the operating condition of said file management information into said reservation field in addition to the management information about said directory and file.

[Claim 2] AV data recorder according to claim 1 which records the information which shows the fact which had renewal of said file management information in said reservation field when said file management information currently recorded on said reservation field was updated.

[Claim 3] AV data recorder according to claim 1 which records the head location block and the last location block on the disk of said reservation field into said reservation field.

[Claim 4] AV data recorder according to claim 1 which records the head location block of the field for file entries of said reservation field, and the head location block of the field for file attribute information into said reservation field.

[Claim 5] AV data recorder according to claim 1 which records the time of day which updated said file management information at the end into said reservation field.

[Claim 6] AV data recorder according to claim 1 which divides said reservation field into N individual (N is the two or more natural numbers), assigns the field for file entries to at least one of said the divided fields, assigns the field for file attribute information to at least one, and is recorded.

[Claim 7] It is the AV data-logging approach of having the file management information which manages as an extent the block with which it continued on the disk, carries out grouping of said extent and is managed as a file. The reservation field for recording the management information about said directory and file on said file management information at the same time it newly creates a directory and a file on said disk is secured. The AV data-

logging approach characterized by recording the information about the operating condition of said file management information into said reservation field in addition to the management information about said directory and file.
[Claim 8] The AV data-logging approach according to claim 7 which records the information which shows the fact which had renewal of said file management information in said reservation field when said file management information currently recorded on said reservation field was updated.
[Claim 9] The AV data-logging approach according to claim 7 which records the head location block and the last location block on the disk of said reservation field into said reservation field.
[Claim 10] The AV data-logging approach according to claim 7 which records the head location block of the field for file entries of said reservation field, and the head location block of the field for file attribute information into said reservation field.
[Claim 11] The AV data-logging approach according to claim 7 which records the time of day which updated said file management information at the end into said reservation field.
[Claim 12] The AV data-logging approach according to claim 7 which divides said reservation field into N individual (N is the two or more natural numbers), assigns the field for file entries to at least one of said the divided fields, assigns the field for file attribute information to at least one, and is recorded.
[Claim 13] The disk recorded on any 1 term of claims 1-6 by AV data recorder of a publication.
[Claim 14] The disk recorded on any 1 term of claims 7-12 by the AV data-logging approach of a publication.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to AV data recorder which was suitable when AV data, such as a digital image, were recorded and reproduced, and its approach.

[0002]

[Description of the Prior Art] In recent years, use of an optical disk is progressing as a record medium for the digital image containing a dynamic image by the densification of an optical disk. The application range is extensive, only as a peripheral device of a computer, even a video player for home use is attained to, and being used from now on as a record medium for an image transcription further replaced with a tape medium is expected.

[0003] In such a broad applicable field, in order to treat data in common, generally managing data in the logical unit of a file is performed. As one of the file management approaches of these, there is a file system using the format by UDF (Universal Disk Format) specification.

[0004] UDF specification is prescribed that medium compatibility is securable among various kinds of OS's for computers (Operating System), and is adopted also in the DVD video playr which is consumer appliances further. And a support on a future still broader platform is expected.

[0005] Hereafter, the configuration of the file system (henceforth a "UDF file system") using UDF specification is explained, referring to a drawing. The example of a configuration of AV data recorder which applied the conventional AV data-logging approach to drawing 11 is shown.

[0006] In drawing 11 , 101 shows disks, such as a magneto-optic disk, 102 shows a record-medium mechanical component, for example, when a disk 101 is a magneto-optic disk, the record-medium mechanical component 102 consists of spindle motors etc.

[0007] Moreover, 103 shows record/playback section, for example, when a disk 101 is a magneto-optic disk, it consists of an optical pickup, the magnetic head, a servo circuit, a strange demodulator circuit, etc. 104 shows the memory section and memorizes data temporarily at the time of record of data, and playback. 105 shows a disk drive unit and consists of a disk 101, a record-medium mechanical component 102, the record/playback section 103, and the memory section 104.

[0008] To AV input signal which showed AV signal-processing section, for example, was inputted from the CCD camera etc., MPEG compression etc. is processed, or 106 processes MPEG decode etc. to AV data read from the disk 101, and outputs it to a monitor etc.

[0009] Furthermore, 107 shows the system control section and performs control of AV signal-processing section 106 and the disk drive unit 105.

[0010] Thus, in the constituted data-logging regenerative apparatus, at the time of record of data, AV signal inputted into AV signal-processing section 106 is transmitted to the memory section 104 according to control of the system control section 107, after picture compression processing of an MPEG method etc. is performed.

[0011] Next, by the system control section 107, the record-medium mechanical component 102 and record/playback section 103 operate, and the data on the memory section 104 are recorded on a disk 101.

[0012] At the time of playback of data, the record-medium mechanical component 102 and record/playback section 103 operate, and the data currently recorded on the disk 101 are transmitted to the memory section 104 by the system control section 107.

[0013] Next, by control of the system control section 107, data are read from the memory section 104 and it outputs as an AV signal from AV signal-processing section 106.

[0014] Next, it explains, referring to a drawing about the example of a configuration of the UDF file system which is the file management approach from the former. Drawing 12 is structural drawing in the volume space of UDF constituted by the disk 101.

[0015] In drawing 12 , in order to treat a disk 101 as logical volume, a disk 101 top is divided into the unit called a sector, and the logical sector number (LSN) from 0 (zero) to the last logical sector (Last LSN) is assigned to the sector. Moreover, volume structure is recorded on a part for the head part in volume space, and a trailer. Furthermore, the partition space where the file which is the structure information and user data of a file is recorded among such volume structures is assigned.

[0016] In partition space, a logical-block number (LBN) is assigned in a sector

unit from the head sector in the range from 0 (zero) to the last logical-block number (Last LBN). Drawing 13 is structural drawing in partition space when the directory structure shown in drawing 14 </A> is recorded on a disk 101 .

[0017] In drawing 14 , a directory DIR 1 exists under a ROOT directory, and FILE 1_1 and FILE 1_2 exist under a directory DIR 1. At this time, a tooth-space bit map descriptor is recorded on LBN=0-79 in drawing 13 .

[0018] It has the tooth-space bit map which shows whether a tooth-space bit map descriptor can assign each logical block. It means that each bit of a tooth-space bit map supports each logical block, that logical block is in the condition of not assigning when this bit value is '1', and it is in the condition of assigning, at the time of '0' (zero).

[0019] A file set descriptor (File Set Descriptor) is recorded on LBN=80. The positional information of the file entry of a root directory is recorded on the file set descriptor. A file entry is explained to a detail later.

[0020] A termination descriptor is recorded on LBN=81. A termination descriptor expresses the termination of a file set descriptor.

[0021] The file entry of a root directory is recorded on LBN=82. A file entry (File Entry) stores the information about the attribute information and the record location of a file where each file propers are various, and the magnitude of a file etc., and it is used in order to manage a file as a group of an extent. An extent is explained to a detail later.

[0022] The example of a configuration of a file entry is shown in drawing 15 . In partition space, the information for distinguishing various descriptors, such as a tooth-space bit map descriptor, a file set descriptor, and a file entry, is recorded on a descriptor tag field. In the case of the file entry, it is determined that the value 261 is described. The attribute information about the file entry itself is recorded on an ICB (Information Control Block) tag field. The extended attribute field is used in order to describe attribute information other than the contents specified in the attribute information field in a file entry. Only the number which needs the allocation descriptor which manages the field of the continuous logical block as one extent is recorded on the allocation descriptor field.

[0023] The configuration of an allocation descriptor is shown in drawing 16 .

An extent is shown by extent length and the extent location in an allocation descriptor.

[0024] Drawing 17 shows the interpretation of 2 bits of high orders of extent length contained in an allocation descriptor. The allocation condition and record condition of the extent are expressed by the value of 2 bits of high orders. When a value is '0' (zero), it is an extent recorded [assignment ended and], and the data of a file are recorded. When a value is '1', it is assignment ending and a non-recorded extent, and data are not recorded although the field is assigned to specific file/directory. When a value is '2', it is un-assigning and a non-recorded extent, and data are not recorded. When a value is '3', it is the extent of a continuation of an allocation descriptor. It is possible to record two or more allocation descriptors on the allocation descriptor field in a file entry, and the assembly of the extent managed by those allocation descriptors constitutes one file.

[0025] The file name and the positional information of a file entry of the file included to the directory are recorded on the directory. In UDF, a directory is also a kind of a file and it is recorded on LBN=83 or LBN=85 in drawing 13 .

[0026] The example of a configuration of the directory file currently recorded on LBN=85 is shown in drawing 18 . The directory file consists of multiple-files discernment descriptors, and each file identification descriptor has the information about each file included to the directory. The main information which each file identification descriptor has is the file names and the positional information of a file entry of the file to which it corresponds.

[0027] Below, from a disk with the structure of the UDF file system mentioned above, the actuation whose data-logging regenerative apparatus reads a desired file is explained. Drawing 19 shows the logical structure of the directory/file within the file management information according to UDF specification.

[0028] In drawing 19 , the file set descriptor is recorded on the location where it was beforehand set in partition space as a part of file management information. The record location of the file entry for ROOT directory files is stored in the file set descriptor. The record location of the file entry of a directory DIR 1 is stored in the file identification descriptor in a ROOT

directory file. A multiple-files discernment descriptor exists in the file in a directory DIR 1, and the record location of the file name of FILE 1_1 and FILE 1_2 and a file entry is stored, respectively.

[0029] When it has a layered structure as shown in drawing 19 , the actuation when gaining the record location of the target file is explained. Here, suppose that a file FILE 1_1 is the target file.

[0030] First, the contents of the ROOT directory file are read. That is, with reference to a file set descriptor, the location of the file entry of a ROOT directory is gained from there. And while reading an allocation descriptor from a file entry and obtaining the location and die length of an extent of a ROOT directory file, the data of a ROOT directory file are read. By scanning the information on the obtained ROOT directory file, the file identification descriptor which is in agreement with target directory name DIR1 is detectable.

[0031] Next, the contents of the target directory file are read. That is, if the file identification descriptor which is in agreement with the target directory is detected, while acquiring the positional information of a file entry from the contents of this file identification descriptor, the file entry concerned is read. An allocation descriptor is read from the file entry about this directory, and while obtaining the location and die length of an extent which are recorded there, the data of a directory file are read.

[0032] The data of the file of the directory DIR 1 read in order to read the target file to the last are scanned, and the file identification descriptor which is in agreement with target file name FILE 1_1 is detected. If the file identification descriptor which is in agreement with the target directory is detected, while acquiring the positional information of a file entry from this file identification descriptor, the file entry is read. And an allocation descriptor is read from a file entry, and while obtaining the location and die length of an extent which are recorded there, the data of the target file FILE 1_1 are read.

[0033] Next, the actuation whose data recorder records data on a disk with the structure of a UDF file system is explained. Here, the case where FILE 1_3 is further recorded on the bottom of a directory DIR 1 is described to the disk which has the partition space shown in drawing 13 .

[0034] First, a tooth-space bit map is scanned and a bit obtains the logical

block in the condition of '1' of not assigning. The data of FILE 1_3 are recorded as an extent to the logical block in the condition of not assigning. If record of an extent is completed, the file entry which points out FILE 1_3 to the logical block in the condition of not assigning will be recorded.

[0035] At this time, only the number which the positional information and the extent length showing FILE 1_3 of an extent need as an allocation descriptor is recorded on a file entry. The file identification descriptor which points out FILE 1_3 to the file of the directory DIR 1 which is a parent directory of FILE 1_3 is recorded.

[0036] The file name of FILE 1_3 and the positional information of a file entry are recorded on this file identification descriptor. The bit in the tooth-space bit map corresponding to the sector it became finishing by the above-mentioned processing assigning is set to '0' (zero), and it considers as the condition of assigning.

[0037] Logical volume space comes to be shown in drawing 20 as a result of the above processing. In addition, the sequence of processing over file management information is not restricted to especially the above-mentioned example, and can be performed in other sequence.

[0038]

[Problem(s) to be Solved by the Invention] However, there are the following troubles in the file management approach using UDF mentioned above. That is, in UDF, a directory is recorded in partition space as a file, and a file entry is also further recorded in partition space. Therefore, these directory files and file entries may be distributed and arranged on a disk.

[0039] Therefore, if the directory file and the file entry are distributed when it is going to read all the files under a certain directory, the seek operation to a disk will occur frequently.

[0040] For example, also in drawing 20 , each file entry of FILE 1_1, FILE 1_2, and FILE 1_3 is distributed and arranged, and becomes indispensable [seek operation] to the read-out. Therefore, when the file which it is going to reproduce is a file as which real-time playback of AV file etc. is required, there is a possibility that the implementation may become difficult according to generating of seek operation.

[0041] Also when similarly real-time record of AV file etc. is required and it is going to record a file entry after recording the AV data itself, the seek operation to a disk will occur and AV data logging in the meantime will stop.
[0042] Moreover, although it is possible to reduce the count of seeking to a disk by reading all file management information into memory, and performing on-memory processing at the time of starting of equipment, also then much seek operation will occur and starting will take time amount. Furthermore, since required memory space cannot predict beforehand, it will be difficult to build the system which has arranged the computer resource efficiently.
[0043] That a trouble which was mentioned above should be solved, even if this invention is the case where a UDF file system is used, it aims at offering AV data recorder and the approach of stopping seek operation to the minimum.
[0044]
[Means for Solving the Problem] AV data recorder applied to this invention in order to attain the above-mentioned purpose The disk as a record medium of AV data, and the record-medium mechanical component which drives a disk, The record playback section which records data on a disk or reproduces the recorded data, The memory section which memorizes data temporarily, and AV signal-processing section which carries out the interconversion of AV signal and the digital signal, It is AV data recorder equipped with the system control section which controls the record approach. It has the file management information which manages as an extent the block with which it continued on the disk, carries out grouping of the extent and is managed as a file. The reservation field for recording a directory and the management information about a file on file management information at the same time it newly creates a directory and a file on a disk is secured. It is characterized by recording the information about the operating condition of file management information into a reservation field in addition to a directory and the management information about a file.
[0045] The need of writing file attribute information and a file entry in a disk by this configuration whenever it creates a file is lost, and since it becomes possible to decrease the count of seek operation sharply, it becomes possible

to carry out record playback certainly also about AV data which are mass data of which real time nature is required.

[0046] Moreover, when the file management information currently recorded on the reservation field is updated, as for AV data recorder concerning this invention, it is desirable to record the information which shows the fact which had renewal of file management information in the reservation field. It is because write return of attribute information is enabled to judge simply that it is the need and it becomes possible to avoid the unnecessary seek operation when not being rewritten based on the existence of renewal of file management information.

[0047] Moreover, as for AV data recorder concerning this invention, it is desirable to record the head location block and the last location block on the disk of a reservation field into a reservation field. By referring to the head location block of a reservation field, and the last location block, it is because it becomes possible to pinpoint the write-in location at the time of a recording start easily and the unnecessary seek operation for write-in location retrieval can be avoided.

[0048] Moreover, as for AV data recorder concerning this invention, it is desirable to record the head location block of the field for file entries of a reservation field and the head location block of the field for file attribute information into a reservation field. By referring to the head location block of the field for file entries of a reservation field, and the head location block of the field for file attribute information, it is because the write-in location at the time of a recording start can be pinpointed easily and unnecessary seek operation can be avoided.

[0049] Moreover, as for AV data recorder concerning this invention, it is desirable to record the time of day which updated file management information at the end into a reservation field. It is because it can judge easily that AV file was written in the record medium which should record by recording and comparing the time of a last update date with file management information.

[0050] Moreover, AV data recorder concerning this invention divides a reservation field into N individual (N is the two or more natural numbers), and

it is desirable to assign the field for file entries to at least one of the divided fields, to assign the field for file attribute information to at least one, and to record. It is because the write-in location at the time of a recording start can be pinpointed easily and unnecessary seek operation can be avoided.

[0051] Next, the AV data-logging approach which starts this invention in order to attain the above-mentioned purpose It is the AV data-logging approach of having the file management information which manages as an extent the block with which it continued on the disk, carries out grouping of the extent and is managed as a file. The reservation field for recording a directory and the management information about a file on file management information at the same time it newly creates a directory and a file on a disk is secured. It is characterized by recording the information about the operating condition of file management information into a reservation field in addition to a directory and the management information about a file.

[0052] The need of writing file attribute information and a file entry in a disk by this configuration whenever it creates a file is lost, and since it becomes possible to decrease the count of seek operation sharply, it becomes possible to carry out record playback certainly also about AV data which are mass data of which real time nature is required.

[0053] Moreover, when the file management information currently recorded on the reservation field is updated, as for the AV data-logging approach concerning this invention, it is desirable to record the information which shows the fact which had renewal of file management information in the reservation field. It is because write return of attribute information is enabled to judge simply that it is the need and it becomes possible to avoid the unnecessary seek operation when not being rewritten based on the existence of renewal of file management information.

[0054] Moreover, as for the AV data-logging approach concerning this invention, it is desirable to record the head location block and the last location block on the disk of a reservation field into a reservation field. By referring to the head location block of a reservation field, and the last location block, it is because it becomes possible to pinpoint the write-in location at the time of a recording start easily and the unnecessary seek operation for write-in location

retrieval can be avoided.

[0055] Moreover, as for the AV data-logging approach concerning this invention, it is desirable to record the head location block of the field for file entries of a reservation field and the head location block of the field for file attribute information into a reservation field. By referring to the head location block of the field for file entries of a reservation field, and the head location block of the field for file attribute information, it is because the write-in location at the time of a recording start can be pinpointed easily and unnecessary seek operation can be avoided.

[0056] Moreover, as for the AV data-logging approach concerning this invention, it is desirable to record the time of day which updated file management information at the end into a reservation field. It is because it can judge easily that AV file was written in the record medium which should record by recording and comparing the time of a last update date with file management information.

[0057] Moreover, the AV data-logging approach concerning this invention divides a reservation field into N individual (N is the two or more natural numbers), and it is desirable to assign the field for file entries to at least one of the divided fields, to assign the field for file attribute information to at least one, and to record. It is because the write-in location at the time of a recording start can be pinpointed easily and unnecessary seek operation can be avoided.

[0058]

[Embodiment of the Invention] Hereafter, AV data recorder concerning the gestalt of operation of this invention is explained, referring to a drawing. Below, the thing of the file containing the voice data compressed by the MPEG method etc. or image data is called AV file. Moreover, in this specification, a disk shall mean the record medium at large which has disk configurations, such as optical disks, such as DVD-RAM, MO, DVD-R, DVD-RW, and DVD+RW, and a hard disk.

[0059] (Gestalt 1 of operation) The block diagram of AV data recorder concerning the gestalt 1 of the operation of this invention to drawing 1 is shown. In drawing 1 , 1 shows disks, such as a magneto-optic disk, 2 shows a record-medium mechanical component, for example, when a disk 1 is a

magneto-optic disk, the record-medium mechanical component 2 consists of spindle motors etc.

[0060] 3 shows record/playback section, and when a disk 1 is a magneto-optic disk, it consists of an optical pickup, the magnetic head, a servo circuit, a strange demodulator circuit, etc. 4 is the memory section and memorizes data temporarily at the time of record of data, and playback. 5 is a disk drive unit and consists of a disk 1, a record-medium mechanical component 2, the record/playback section 3, and the memory section 4.

[0061] Moreover, to AV input signal which showed AV signal-processing section, for example, was inputted from the CCD camera etc., MPEG compression etc. is processed, or 6 processes MPEG decode etc. to AV data read from disk media, and outputs it to a monitor etc. 8 shows the system control section and performs control of AV signal-processing section 6 and the disk drive unit 5 through an interface 7.

[0062] Thus, in constituted AV data recorder, at the time of record of data, AV signal inputted into AV signal-processing section 6 is transmitted to the memory section 4 according to control of the system control section 8, after picture compression processing of an MPEG method etc. is performed. Next, by control of the system control section 8, the record-medium mechanical component 2 and record/playback section 3 operate, and the data on the memory section 4 are recorded on a disk 1.

[0063] At the time of playback of data, by control of the system control section 8, the record-medium mechanical component 2 and record/playback section 3 operate, and the data currently recorded on the disk 1 are transmitted to the memory section 4. Next, by control of the system control section 8, data are read from the memory section 4 and it outputs as an AV signal from AV signal-processing section 6.

[0064] Drawing 2 is the instantiation Fig. of the file/directory structure in the condition immediately after creating the directory for recording AV file in the gestalt 1 of this operation. In drawing 2 , as for AV_DIR1, ROOT surrounded with the ellipse shows the directory where AV file is recorded in a root directory, respectively, and AVFILES.IFO surrounded with the square shows the management file made in directory AV_DIR1.

[0065] Drawing 3 is the instantiation Fig. of the DS of the partition space in the condition that the file/directory structure shown in drawing 2 were recorded, in the disk used for AV data recorder concerning the gestalt 1 of operation of this invention. In drawing 3 , a tooth-space bit map descriptor is recorded on LBN=0-79. Moreover, henceforth [LBN=251], since it will be in "the condition of not assigning", each bit corresponding to these sectors is set as '1', respectively.

[0066] Furthermore, a file set descriptor is recorded on LBN=80. In addition, when the file entry concerned is a file entry of a root directory, the positional information is recorded on the file set descriptor. Moreover, a termination descriptor is recorded on LBN=81.

[0067] Furthermore, the file identification descriptor of the ROOT directory as a parent directory and the file identification descriptor of directory AV_DIR1 are recorded on LBN=83, and the file entry of directory AV_DIR1 is recorded for the file entry of a ROOT directory on LBN=84 by LBN=82, respectively.

[0068] Next, the file identification descriptor of directory AV_DIR1 as a parent directory and the file identification descriptor of an AVFILES.IFO file are recorded on LBN=85. The file entry of an AVFILES.IFO file is recorded on LBN=86. The management domain of an AVFILES.IFO file is recorded on LBN=87.

[0069] The management domain of AVFILES.IFO takes a configuration like drawing 4 (a), and records a block map as shown in drawing 4 (b). Here, a block map is a map which manages each operating condition of LBN in LBN=88-250. LBN=88-250 are the extent of an AVFILES.IFO file, and the value of 2 bits of high orders of an allocation descriptor is set up so that the extent concerned may be "finishing [an assignment]" and "un-recording."

[0070] Therefore, in actuation of the conventional file system, data cannot be written in LBN=87-250. Below, the extent of this AVFILES.IFO file is called AV reservation field. Since LBN=0-250 are already "finishing [allotment]" as mentioned above, the bit to which it corresponds in a tooth-space bit map is set as '0' (zero).

[0071] When recording AV file on the disk in such a condition, the procedure shown in the flow chart of drawing 5 performs. If record of AV file is started by

directions of a user etc., in drawing 5 , the contents of LBN=0-250 on a disk 1 will be first read on the memory section 4 (step S501). Next, the information on AV reservation field on the memory section 4 is scanned, and the existence of the non-record section where file attribute information and a file entry are only newly recordable is judged (step S502). If judged with there not being sufficient non-record section newly recording (step S502: No), error processing will be performed and AV file record will be ended. If judged with there being non-record sections of enough, file attribute information and a file entry will be recorded on the non-record section in AV reservation field on the memory section 4 (step S503).

[0072] Since the magnitude of the extent of directory AV_DIR1 and the magnitude of an AVFILES.IFO file change by file attribute information and record of a file entry at this time, according to it, the allocation descriptor of the file entry of directory AV_DIR1 and the file entry of an AVFILES.IFO file are rewritten.

[0073] Next, the tooth-space bit map on the memory section 4 is scanned, and the existence of the logical block in the condition that the number required to record AV file continues and of not recording is judged (step S504). If judged with there being no logical block in the condition that the required number continues and of not recording (step S504: No), error processing will be performed and AV file record will be ended. If judged with it being, data will be recorded to the logical block of the disk applicable to the non-record section obtained at step S504 (step S505).

[0074] If record of AV file data is completed, in order to update the file management information on AV file, it records on the allocation descriptor in the file entry on the memory section 4 which created the information about the location and die length of an extent of the AV file at step S503 (step S506). Moreover, required information, such as a file name and file creation time amount, is also updated to file attribute information and a file entry besides an allocation descriptor. To coincidence, it rewrites according to the modification concerned also about the block map in an AVFILES.IFO file.

[0075] Next, it changes into '0' which expresses "finishing [an assignment]" with step S504 about the bit equivalent to the logical block which recorded

data to the tooth-space bit map on the memory section 4 (step S507). And the contents of the memory section 4 are returned to the location of LBN=0-250 on a disk 1 (step S508). Thus, it means that record of a file had recorded AV file on the bottom of directory AV_DIR1.

[0076] What is necessary is to repeat step S607 from step S602, and just to progress to step S608 in the processing flow chart shown in drawing 6 , after record of all AV files is completed after processing of step S601 until record of all AV files is completed when it is going to record two or more AV files continuously. Also at this time, when adding the file entry and file attribute information in the extent of an AVFILES.IFO file in step S605, a judgment whether it is already used is made, using the block map in an AVFILES.IFO file.

[0077] The need of according to the gestalt 1 of this operation as mentioned above writing file attribute information and a file entry in a disk whenever it creates a file is lost, and since it becomes possible to decrease the count of seek operation sharply, it becomes possible to carry out record playback also about AV data which are mass data of which real time nature is required.

[0078] Moreover, according to the processing shown in the flow chart of drawing 5 , the DS of the partition space after FILE1.DAT and FILE2.DAT which are AV file were recorded on the bottom of directory AV_DIR1 comes to be shown in drawing 7 .

[0079] In drawing 7 , LBN uses for record of a new file entry from a large logical block among AV reservation fields, and, on the other hand, file attribute information is recorded in the form added to the last of the "finishing [an assignment]" and the extent "which has not been recorded" of AVFILES.IFO which is a management file.

[0080] Since both a file identification descriptor and a file entry have variable-length DS, it is desirable to record a file identification descriptor from the smaller one of LBN of AV reservation field in this way, and to record a file entry from the larger one of LBN.

[0081] When adding a file entry and file attribute information in the extent of an AVFILES.IFO file, it is because a free area can be judged easily by referring to the block map in an AVFILES.IFO file.

[0082] In addition, after securing two or more continuous free areas in advance of record of actual data and registering with a tooth-space bit map by making them into "the condition of assigning" as it is not limited to the procedure shown in drawing 5 about the procedure of record and is described by the international public presentation W098 / No. 14938 for example, you may make it begin to record actual data.

[0083] Moreover, renewal of the information on the allocation descriptor of directory AV_DIR1 or a tooth-space bit map may be collectively performed, after record of file data is completed.

[0084] Moreover, let processing for making DS of the partition space in a disk into an initial state like drawing 3 be the thing which is the need and which is performed by the way in advance of record of AV file.

[0085] Moreover, the directory/file name on which AV file is recorded may not be limited to what was stated with the gestalt 1 of this operation, and other directory/file names are sufficient as it.

[0086] Moreover, although LBN=0-250 are read into the memory section 4 at the time of record playback, you may make it return only the information which needs to hold none of all information in the memory section 4, and holds only information required at the time of record playback actuation, and has the need for updating to a disk 1.

[0087] Moreover, although LBN=87-250 were made into "finishing [an assignment]" and the extent "which has not been recorded" of an AVFILES.IFO file as an AV reservation field, as long as it does not limit and is secured as a continuation field on a disk LBN=0-250 about the record location and capacity of AV reservation field, other record locations and capacity are sufficient.

[0088] (Gestalt 2 of operation) AV data recorder concerning the gestalt 2 of operation of this invention is explained hereafter, referring to a drawing. In the gestalt 1 of operation mentioned above, it has the description in the gestalt 2 of this operation to recording the block map in the management domain of an AVFILES.IFO file at the point which is recording the modification existence flag of all the attribute information that includes a reservation field in addition to a block map.

[0089] That is, the management domain of an AVFILES.IFO file is recorded on LBN=87. The management domain of AVFILES.IFO takes a configuration as shown in drawing 4 (a), and records the modification existence flag of all attribute information including a reservation field. Here, a modification existence flag shows whether either of LBN=87-250 was rewritten.

[0090] Also when recording AV file on a disk using the modification existence flag of all attribute information including a reservation field, fundamental procedure is the same as the procedure shown in drawing 5 . however, it is changed to the tooth-space bit map on the memory section 4 as a thing which is changed into '0' which expresses "finishing [an assignment]" with step S504 about the bit equivalent to the logical block which recorded data simultaneously (step S507) by which attribute information was rewritten also about the modification existence flag in an AVFILES.IFO file.

[0091] And the contents of the modification existence flag of an AVFILES.IFO file are checked, and when it is shown that attribute information is rewritten, the contents of the memory section 4 are returned to the location of LBN=0-250 on a disk 1. Write return is not performed if not rewritten. (Step S508) . Thus, it means that record of a file had recorded AV file on the bottom of directory AV_DIR1.

[0092] What is necessary is to repeat step S607 from step S602, and just to progress to step S608 in the processing flow chart shown in drawing 6 , after record of all AV files is completed after processing of step S601 until record of all AV files is completed when it is going to record two or more AV files continuously. Also at this time, in step S608, the contents of the modification existence flag of an AVFILES.IFO file are checked, and when it is shown that attribute information is rewritten, the contents of the memory section 4 are returned to the location of LBN=0-250 on a disk 1. Write return is not performed if not rewritten.

[0093] As mentioned above, according to the gestalt 2 of this operation, based on the modification existence flag of an AVFILES.IFO file, write return of attribute information is enabled to judge simply that it is the need, and it becomes possible to avoid the unnecessary seek operation when not being rewritten.

(Gestalt 3 of operation) AV data recorder concerning the gestalt 3 of operation of this invention is explained hereafter, referring to a drawing. With the gestalt 1 of operation, it has the description at the point which is recording the initiation LBN of a reservation field, and the termination LBN of a reservation field in the gestalt 3 of this operation to recording the block map in the management domain of an AVFILES.IFO file in addition to a block map.

[0094] That is, the management domain of an AVFILES.IFO file is recorded on LBN=87. The management domain of AVFILES.IFO takes a configuration as shown in drawing 4 (a), and records the initiation LBN of a reservation field, and the termination LBN of a reservation field. Here, in the gestalt 3 of this operation, it is equivalent to initiation LBN=87 of a reservation field, and termination LBN=250 of a reservation field in the initiation LBN of a reservation field, and the termination LBN of a reservation field.

[0095] When recording AV file on a disk using the initiation LBN of a reservation field, and the termination LBN of a reservation field, the flow of fundamental processing is also the same as that of the procedure shown in the flow chart of drawing 5 .

[0096] Moreover, when recording file attribute information and a file entry on the non-record section in AV reservation field on the memory section 4, with reference to the initiation LBN in the management domain of AVFILES.IFO, it records from LBN=250 about a file entry similarly with reference to [information / file attribute] the termination LBN of a reservation field from LBN=87 (step S503).

[0097] And termination of all processings returns the contents of the memory section 4 to the location of LBN=0-250 on a disk 1. Thus, it means that record of a file had recorded AV file on the bottom of directory AV_DIR1.

[0098] As mentioned above, according to the gestalt 3 of this operation, by referring to the initiation LBN of a reservation field, and the termination LBN of a reservation field, it becomes possible to pinpoint the write-in location at the time of a recording start easily, and it becomes possible to avoid the unnecessary seek operation for write-in location retrieval.

(Gestalt 4 of operation) AV data recorder concerning the gestalt 4 of operation of this invention is explained hereafter, referring to a drawing. With the gestalt

1 of operation, it has the description at the point of making the head location LBN of the field for file entries, and the head location LBN of the field for file attribute information recording in the gestalt 4 of this operation to recording the block map in the management domain of an AVFILES.IFO file in addition to a block map.

[0099] That is, the management domain of an AVFILES.IFO file is recorded on LBN=87. The management domain of AVFILES.IFO takes a configuration as shown in drawing 4 (a), and records the head location LBN of the field for file entries, and the head location LBN of the field for file attribute information. Here, in the case of the gestalt 4 of this operation, it is equivalent to head location LBN=250 of the field for file entries, and head location LBN=87 of the field for file attribute information in the head location LBN of the field for file entries, and the head location LBN of the field for file attribute information.

[0100] Also when recording AV file on a disk using the head location LBN of the field for file entries, and the head location LBN of the field for file attribute information, fundamental procedure is the same as the procedure shown in the flow chart of drawing 5 .

[0101] Moreover, in recording file attribute information and a file entry on the non-record section in AV reservation field on the memory section 4, with reference to the head location LBN of the field for file entries in the management domain of (step S503) AVFILES.IFO, a file entry records file attribute information from LBN=87 similarly with reference to the head location LBN of a file attribute information field from LBN=250.

[0102] And it changes into '0' which expresses "finishing [an assignment]" with step S504 about the bit equivalent to the logical block which recorded data to the tooth-space bit map on the memory section 4 (step S507).

[0103] If all processings are completed, the contents of the memory section 4 will be returned to the location of LBN=0-250 on a disk 1. Thus, it means that record of a file had recorded AV file on the bottom of directory AV_DIR1.

[0104] As mentioned above, according to the gestalt 4 of this operation, by referring to the head location LBN of the field for file entries, and the head location LBN of the field for file attribute information, the write-in location at the time of a recording start can be pinpointed easily, and it becomes possible

to avoid unnecessary seek operation.

[0105] (Gestalt 5 of operation) AV data recorder concerning the gestalt 5 of operation of this invention is explained hereafter, referring to a drawing. With the gestalt 1 of operation, it has the description at the point which is recording the time of a last update date in the gestalt 5 of this operation to recording the block map in the management domain of an AVFILES.IFO file in addition to a block map.

[0106] That is, the management domain of an AVFILES.IFO file is recorded on LBN=87. The management domain of AVFILES.IFO takes a configuration as shown in drawing 4 (a), and records the time of a last update date. Here, at the time of a last update date, it is the time which rewrote the AVFILES.IFO file.

[0107] Also when recording AV file on a disk using the time of a last update date, fundamental procedure is the same as the procedure shown in the flow chart of drawing 5 .

[0108] Moreover, by (step S503), file attribute information, and record of a file entry, in recording file attribute information and a file entry on the non-record section in AV reservation field on the memory section 4, since the magnitude of the extent of directory AV_DIR1 and the magnitude of an AVFILES.IFO file change, according to it, it rewrites the allocation descriptor of the file entry of directory AV_DIR1, and the file entry of an AVFILES.IFO file.

[0109] Furthermore, required information, such as a file name and file creation time amount, is also updated to file attribute information and a file entry besides an allocation descriptor. At this time, the time of the last update date in an AVFILES.IFO file is updated and recorded on the newest time.

[0110] If all processings are completed, the contents of the memory section 4 will be returned to the location of LBN=0-250 on a disk 1. Thus, it means that record of a file had recorded AV file on the bottom of directory AV_DIR1.

[0111] Originally, when record of AV file is performed, rewriting of the management domain of an AVFILES.IFO file occurs. therefore, it surely comes to be in agreement at information and the time of the last update date in an AVFILES.IFO file at the time of the renewal of last indicated by the file entry of each recorded AV file.

[0112] However, when the writing of a file is performed by the approach of changing in the gestalt 5 of this operation with other recording devices, rewriting of the management domain of an AVFILES.IFO file is not generated. In this case, since information and the time of the last update date in an AVFILES.IFO file stop being in agreement at the time of the last update date indicated by each file entry, it turns out that processings other than record of AV file were performed.

[0113] Since it becomes possible to judge easily that AV file was written in the media which should record AV file by recording and comparing the time of a last update date with the management domain of an AVFILES.IFO file as mentioned above according to the gestalt 5 of this operation, unnecessary seek operation is avoidable at the time of record of AV file.

[0114] (Gestalt 6 of operation) AV data recorder concerning the gestalt 6 of operation of this invention is explained hereafter, referring to a drawing. With the gestalt 1 of operation, a file entry is assigned to at least one of the management domains which divided and divided the management domain into plurality in the gestalt 6 of this operation in addition to said to recording the block map in the management domain of an AVFILES.IFO file, and it has the description at the point of making file attribute information assigning and recording on at least one.

[0115] Drawing 8 is the instantiation Fig. of the DS of the initial partition space in the disk used for AV data recorder concerning the gestalt 6 of operation of this invention. In drawing 8 , a tooth-space bit map descriptor is recorded on LBN=0-79. Moreover, henceforth [LBN=251], since it will be in "the condition of not assigning", each bit corresponding to these sectors is set as '1', respectively.

[0116] As shown in drawing 8 , the non-record section in AV reservation field of LBN=88-250 is divided into two fields, LBN=88-169 and LBN=170-250, and each is assigned as the field for file entries, and a field for file attribute information.

[0117] The management domain of an AVFILES.IFO file is recorded on LBN=87. The management domain of an AVFILES.IFO file takes a configuration as shown in drawing 9 , and records the head location LBN of

the assigned field for file entries, and the head location LBN of the field for file attribute information. Here, about the gestalt 6 of this operation, it is equivalent to head location LBN=170 of the field for file entries, and head location LBN=87 of the field for file attribute information in the head location LBN of the field for file entries, and the head location LBN of the field for file attribute information.

[0118] When recording AV file on the disk in such a condition, the procedure shown in the flow chart of drawing 5 performs. First, the contents of LBN=0-250 on a disk 1 are read on the memory section 4 (step S501). Next, the information on AV reservation field on the memory section 4 is scanned, and the existence of the non-record section where file attribute information and a file entry are only newly recordable is judged (step S502). If judged with there not being sufficient non-record section newly recording (step S502: No), error processing will be performed and AV file record will be ended. If judged with there being non-record sections of enough, file attribute information and a file entry will be recorded on the non-record section in AV reservation field on the memory section 4 (step S503).

[0119] Here, about a file entry, it records from LBN=170 with reference to the head location LBN of the field for file entries in the management domain of AVFILES.IFO, and records from LBN=87 with reference to the head location LBN of a file attribute information field similarly about file attribute information.

[0120] Since the magnitude of the extent of directory AV_DIR1 and the magnitude of an AVFILES.IFO file change by file attribute information and record of a file entry at this time, according to it, the allocation descriptor of the file entry of directory AV_DIR1 and the file entry of an AVFILES.IFO file are rewritten.

[0121] Next, the tooth-space bit map on the memory section 4 is scanned, and the existence of the logical block in the condition that the number required to record AV file continues and of not recording is judged (step S504). If judged with there being no logical block in the condition that the required number continues and of not recording (step S504: No), error processing will be performed and AV file record will be ended. If judged with it being, data will be recorded to the logical block of the disk applicable to the non-record

section obtained at step S504 (step S505).

[0122] If record of AV file data is completed, in order to update the file management information on AV file, it records on the allocation descriptor in the file entry on the memory section 4 which created the information about the location and die length of an extent of the AV file at step S503 (step S506).

[0123] Next, it changes into '0' which expresses "finishing [an assignment]" with step S504 about the bit equivalent to the logical block which recorded data to the tooth-space bit map on the memory section 4 (step S507). And the contents of the memory section 4 are returned to the location of LBN=0-250 on a disk 1 (step S508). Thus, it means that record of a file had recorded AV file on the bottom of AV_DIR1 directory. The partition space after AV file was recorded becomes a configuration like drawing 10 .

[0124] As mentioned above, according to the gestalt 6 of this operation, a management domain is divided into plurality, and by assigning a file entry to at least one of the divided management domains, and assigning file attribute information to at least one, the write-in location in a recording start can be judged easily, and it becomes possible to avoid unnecessary seek operation at the time of record of AV file.

[0125]

[Effect of the Invention] According to this invention, it becomes possible to stop the seek operation of the disk which becomes the hindrance for real-time-recording and reproducing AV file to the minimum as mentioned above by recording file management information and the attribute information on AV file on the continuation field secured beforehand.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The block diagram of AV data recorder concerning the gestalt 1 of operation of this invention

[Drawing 2] The instantiation Fig. of the initial directory structure in AV data recorder concerning the gestalt 1 of operation of this invention

[Drawing 3] The instantiation Fig. of the initial partition space in AV data recorder concerning the gestalt 1 of operation of this invention

[Drawing 4] The instantiation Fig. of the record section of the file management information in AV data recorder concerning the gestalt 1 of operation of this invention

[Drawing 5] The flow chart of record processing of AV file in AV data recorder concerning the gestalt 1 of operation of this invention

[Drawing 6] The flow chart of record processing of AV file in AV data recorder concerning the gestalt 1 of operation of this invention

[Drawing 7] The instantiation Fig. of the partition space after AV file record in AV data recorder concerning the gestalt 1 of operation of this invention

[Drawing 8] The instantiation Fig. of the initial partition space in AV data recorder concerning the gestalt 6 of operation of this invention

[Drawing 9] The instantiation Fig. of the record section of the file management information in AV data recorder concerning the gestalt 6 of operation of this invention

[Drawing 10] The instantiation Fig. of the partition space after AV file record in AV data recorder concerning the gestalt 6 of operation of this invention

[Drawing 11] The block diagram of the conventional AV data recorder

[Drawing 12] The instantiation Fig. of the volume space structure in the conventional AV data recorder

[Drawing 13] The instantiation Fig. of the partition space in the conventional AV data recorder

[Drawing 14] The instantiation Fig. of the directory structure in the conventional AV data recorder

[Drawing 15] The instantiation Fig. of the file entry in the conventional AV data recorder

[Drawing 16] The instantiation Fig. of the allocation descriptor in the conventional AV data recorder

[Drawing 17] The interpretation explanatory view of extent length in the conventional AV data recorder

[Drawing 18] The configuration instantiation Fig. of the directory file in the conventional AV data recorder

[Drawing 19] The instantiation Fig. of the layered structure of the file in the conventional AV data recorder

[Drawing 20] The instantiation Fig. of the partition space after the record in the conventional AV data recorder

[Description of Notations]

1,101 Disk

2,102 Record-medium mechanical component

3,103 Record/playback section

4,104 Memory section

5,105 Disk drive unit

6,106 AV signal-processing section

7,107 System control section